EXHIBIT 1

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

NCS MULTISTAGE INC., Plaintiff, v. NINE ENERGY SERVICE, INC., Defendant.	CIVIL ACTION NO. 6:20-CV-00277-ADA **JURY TRIAL DEMANDED**

SUPPLEMENTAL DECLARATION OF DR. NATHAN MEEHAN

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I. INTRODUCTION

1. My name is Nathan Meehan, Ph.D. I have been retained on behalf of Nine Energy Services, Inc. ("Nine") to provide expert opinions regarding U.S. Patent No. 10,465,445 (the "'445 Patent" or the "Asserted Patent"). Based on my analysis and investigation, I previously reached certain conclusions and developed certain opinions on the issues relating to the Asserted Patent that are set forth in my first declaration (the "First Declaration") in support of Nine's opening claim construction brief. *See* Nine Opening Brief ("Nine Br."), Ex. 1. Thus, I hereby incorporate by reference into this supplemental declaration (the "Supplemental Declaration") my analyses, opinions, summaries, and understandings provided in the First Declaration.

2. Based on further analysis and investigation of Plaintiff NCS Multistage Inc.'s ("NCS") opening claim construction brief (Dkt. 41 or "NCS Br."), the declaration of NCS's expert in support of NCS's opening claim construction brief (NCS Br., Ex. 1), and the transcript of NCS's expert's deposition, I have reached certain conclusions and developed certain opinions on the issues relating to the Asserted Patent that are set forth below.

3. I understand the scope of this Supplemental Declaration is limited to the Court's claim construction proceedings, and, therefore, I confine my opinions regarding the Asserted Patent to issues solely related to the construction and indefiniteness of the claims. This Supplemental Declaration is based on information currently available to me. I reserve the right to continue my investigation and study, which may include a review of documents and information that has been or may be produced, as well as deposition testimony from depositions for which transcripts are not yet available or that may later be taken in this case.

4. Therefore, I expressly reserve the right to expand or modify my opinions as my investigation and study continues, and to supplement my opinions in response to any additional

information that becomes available to me, any matters raised by the plaintiff or opinions provided by its expert(s), or in light of any relevant orders from the Court.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

5. I have provided an updated copy of my *curriculum vitae* ("CV") with this Supplemental Declaration. *See* Ex. 2. My qualifications and professional experiences are also provided in the First Declaration. *See* Nine. Br., Ex. 1 at ¶¶3-12.

III. SUMMARY OF OPINIONS AND MATERIALS CONSIDERED

6. To prepare this Supplemental Declaration, I have reviewed and considered the '445 Patent, the prosecution history associated with the '445 Patent, NCS's opening claim construction brief (Dkt. 41 or "NCS Br."), NCS's expert's declaration in support of NCS's opening claim construction brief (NCS Br., Ex. 1), and the transcript from NCS's expert's deposition. Additionally, I have considered my knowledge and direct relevant experience in the industry at the time of the Asserted Patent's respective filing date and earliest priority date. I am also aware of information generally available to, and relied upon by, persons of ordinary skill in the art at the relevant time.

7. It remains my opinion that the following claim terms would be understood by a person of ordinary skill in the art at the time of the alleged invention, in possession of the specification, claims, and prosecution history ("POSA") as follows:

Term #	Disputed Claim Term	Understanding of a POSA
1	"internal diameter" (Claims 1, 22, 28, 50)	the diameter of a fluid channel measured perpendicularly from the inner wall of the fluid channel through the center of the casing string, to the opposite inner wall
2	"tubular member" (Claims 1, 22, 28, 50)	an upper tubular member, and a lower tubular member coupled with the upper tubular member
3	"sealing engagement" (Claims 1, 22, 28, 50, 55)	attached or secured to create a fluid-tight seal

Term #	Disputed Claim Term	Understanding of a POSA
4	"the rupture disc is. . . configured to rupture when exposed to a rupturing force greater than the rupture burst pressure" (Claims 1, 22, 29, 56).	**Term is Indefinite Under 35 U.S.C. § 112** **Proposed Alternative** – the rupture disc will rupture when exposed to a rupturing hydraulic pressure greater than the rupture burst pressure
5	"rupturing force" (Claims 1, 22, 27, 29, 56, 57)	**Term is Indefinite Under 35 U.S.C. § 112** **Proposed Alternative** – rupturing hydraulic pressure
6	"the region of the tubular member where the rupture disc is attached has a larger internal diameter than the internal diameter of the casing string and is parallel to the internal diameter of the casing string" (Claims 1, 22, 28, 50)	**Term is Indefinite Under 35 U.S.C. § 112** **Proposed Alternative** – a flat surface of the tubular member where the rupture disc is fastened, affixed, joined, or connected to the tubular member is circular and has a diameter larger than the internal diameter of the casing string, and defines a plane that is parallel to a plane defined by the set of internal diameters at a location in the casing string
7	"specific gravity . . . of the well fluid" (Claims 24, 52)	**Term is Indefinite Under 35 U.S.C. § 112**
8	"disengage the rupture disc from sealing engagement" (Claim 55)	disengage the rupture disc from being attached or secured to create a fluid-tight seal
9	"rupture disc is configured to disengage from sealing engagement when exposed to a pressure greater than a hydraulic pressure in the casing string" (Claims 28, 50)	**Term is Indefinite Under 35 U.S.C. § 112**
Term #	**Agreed Claim Term**	**Understanding of a POSA**
10	"float shoe" (Claims 15 & 43)	a sealing device disposed at the lower end of the casing string
11	"a pressure . . . greater than a hydraulic pressure in the casing string" (Claims 28, 50, 55)	an applied pressure that is greater than the hydrostatic pressure in the casing string
12	"a portion of the sealed chamber is buoyant in the well fluid" (Claim 46)	the density of a portion of the sealed chamber is lower than that of the surrounding wellbore fluid

IV. PERSON OF ORDINARY SKILL IN THE ART

8. I understand that NCS's expert has opined that a person of ordinary skill in the art ("POSA") for purposes of the '445 Patent is a person who has a combination of at least one year of practical experience in developing and/or operating downhole plugging devices or barriers, as well as an undergraduate level degree in petroleum or mechanical engineering, or at least three years of practical experience in designing and developing downhole plugging devices, where such experience includes plugging devices or pressure barriers including at least one of packers, plugs, or other sealing mechanisms that involve hydraulic seals, sliding sleeves, and other common hydraulic components commonly used in downhole tools.

9. I disagree with this definition of a POSA for several reasons. First, it expressly includes people with merely an undergraduate degree, and a single year in operating – but not developing – downhole plugging devices or barriers. I do not believe that an individual without any experience developing downhole devices of any kind can qualify as a POSA in the field of invention of the '445 Patent, without significantly more than a year of merely operating downhole tools. Further, all of the definitions of a POSA focus solely on plugging or sealing devices, but do not require any experience in well construction or casing flotation, both of which are essential skills for a POSA in the field of the '445 Patent.

10. It remains my opinion that a POSA at the time of the alleged invention is a person with a Bachelor's degree, Master's Degree, and/or Ph.D. in Mechanical Engineering or Petroleum Engineering, or at least five years of experience working in horizontal well construction. *See* Meehan Dec., at ¶ 35.

V. DISPUTED CLAIM TERMS

A. "internal diameter" (Claims 1, 22, 28, and 50)

Defendant Nine's Construction	Plaintiff NCS's Construction
the diameter of a fluid channel measured perpendicularly from the inner wall of the fluid channel through the center of the casing string, to the opposite inner wall	No construction

11. NCS and its expert claim that the term "internal diameter" can have two meanings in the petroleum drilling industry that "can vary based on the context in which it is used." NCS Br., Ex. 1 (Rodgers Dec.), at ¶41; NCS Br., at 4. According to NCS's expert, "interal diameter" can mean "the interior cylindrical surface of the casing" or "a length of measurement of the diameter of a circular corss-section cut perpendicular to the axis of the inside of a component of the casing." NCS Br., Ex. 1, at 41-1, ¶¶41, 43. According to NCS, "internal diameter" as used in the petroleum industry can be defined as "the walls of the pipe" or "a cross-sectional line segement from a wall of the pipe to the wall on the opposite side of the pipe." NCS Br., at 4.

12. I strongly disagree. While it may be possible that a POSA at some time has carelessly referred to a "sidewall" of a pipe as its inside diameter or internal diameter (the "Sidewall Definition"), that is not an accepted or well-known industry definition in the petroleum industry, or any other industry of which I am aware. Even in such careless use of the word "internal diameter" to a sidewall, such a use would not be presumed. A POSA would presume that "internal diameter" referred to a diameter (the "Diameter Definition") absent clear and express context that made it indisputably clear that was was being referred to was a sidewall.

13. NCS's expert cites two passages from the specification to support his opinion regarding the term "internal diameter." NCS Br., Ex. 1, at ¶41. However, as illustrated in the table below,

a POSA would not understand what these portions of the specification meant if the terms "inside diameter," "internal diameter," "inner diameter," and "diameter" were replaced with "sidewall."

	Inside/Internal Diameter	**Walls of the Pipe**
Nine Br., Ex. 2, at 6:62-66	"Once the disc has been ruptured, the inside diameter of the casing string in the region of the rupture disc assembly 10 is substantially the same as that in the remainder of the casing string (e.g. casing ID (inner diameter) is restored following rupture of the disc)"	"Once the disc has been ruptured, the [sidewall] of the casing string in the region of the rupture disc assembly 10 is substantially the same as that in the remainder of the casing string (e.g. casing ID (inner [sidewall] is restored following rupture of the disc)"
Nine Br., Ex. 2, 10:47-53	"The shattering of rupture disc 30 results in opening of passageway 14 of lower tubular member 18, so that the casing internal diameter in that 50 region of lower tubular member may be restored to substantially the same diameter as the rest of the casing string (e.g. the casing string above and below the tubular or region in which the rupture disc was installed)."	"The shattering of rupture disc 30 results in opening of passageway 14 of lower tubular member 18, so that the casing internal [sidewall] in that 50 region of lower tubular member may be restored to substantially the same [sidewall] as the rest of the casing string (e.g. the casing string above and below the tubular or region in which the rupture disc was installed)."

14. Further, there is no instance of the term "diameter," "internal diameter," or any synonym thereof in the Specification that clearly refers to "the walls of the pipe" or a "cylindrical surface of the casing." Instead the specification describes "diameter" and "internal diameter" as a scalar quantity represented by a real number and units of measurement. For example, the specification of the '445 Patent states:

> In the illustrated embodiment, the ***diameter*** of disc 30 at edge 39 may be ***4.8 inches***, for example. The ***diameter*** of the top of the radially expanded region 25 of lower tubular member 18 may be similar. The ***diameter*** of constricted opening 27 of lower tubular member 18 may be ***4.5 inches*** (which is a ***common ID for a casing***, although other dimensions of both the disc and upper and lower tubular members are possible, provided that the disc seals the lower tubular member and that the disc can be "forced" close to or into the constricted opening of the lower tubular member 18 and/or against the radially expanded portion of lower tubular member 18).

Nine Br., Ex. 2, at 8:19-30. Here, the specification describes the diameter of the disc, the radially expanded region, the constricted opening, and the tubular member with a real number and inches. Thus, it is my opinion that a POSA, in light of the specification, would understand "internal diameter" to be a scalar property and mean "the diameter of a fluid channel measured perpendicularly from the inner wall of the fluid channel through the center of the casing string, to the opposite inner wall."

15. I agree with NCS's expert that the World Oil Casing Reference Tables, an industry publication describing specifications for casing strings, uses the term "ID" clearly and undisputably under its diameter meaning. NCS Opening Br. ("NCS Br."), Ex. L.

16. Rather than rely on cherry-picked references to determine the usage and meaning of the term "internal diameter" in the field of horizontal well construction, I conducted an informal survey of the petroleum engineering literature to determine how the term is used. To do this, I used OnePetro.org, a website managed by the Society of Petroleum Engineers, to provide professional access to oil and gas literature primarily in the Exploration and Production areas of the oil and gas industry, which includes horizontal well construction. Available papers come from a variety of journals and conference proceedings, as listed in Exhibit A to my declaration, *infra*. I searched for the terms "inside diameter" or "internal diameter" and the word "casing" published between 2010 and 2014, resulting in 389 search hits. I downloaded the first 50 hits and, in each one, searched for the term "diameter," and read enough of the context to determine how the term was being used. A complete list of these documents is attached to this declaration as Exhibit B.

17. From these documents, fourty-nine of them solely and unambiguously used the term "internal diameter" or "inside diameter" according to the Diameter Definition. Only in one document is the use of the term "inside diameter" arguably used to refer to a sidewall. Alfredo

Sanchez et al., *Casing Centralization in Horizontal and Extended Reach Wells*, SPE 150317 (20-22 March 2012). That sole document describes frictional forces between the outer diameter of a casing string, and the inner diameter of centralizers. Because this document is clearly describing frictional forces between the outer surface of the casing string and the inner surface of centralizers, the context makes clear that what is referred to is the inner walls of the centralizer. This is consistent with my opinion that the term "inside diameter" may be used carelessly to refer to a sidewall, as is made clear by the context here. Further confirming this conclusion, this document was not subjected to peer-review, and was presented at a small conference in Vienna.

18. Given the reasonable sample size, I conclude from this survey that a POSA would understand that the term "internal diameter" carries its plain and ordinary meaning, and is understood according to the Diameter Definition in the relevant art. Further, it is clear to me that there is no generally accepted or understood definition in the relevant art that "internal diameter" carries a Sidewall definition, and even where it is used carelessly to refer to a sidewall, such uses are rare, and made clear from context.

19. In my opinion, nothing about the phrase "the casing string having an internal diameter that defines a fluid passageway," as used in the preamble of the independent claims of the '445 Patent, suggests that the term "internal diameter" is being used under the Sidewall Definion of "internal diameter." Instead, it is well-known that the size of a fluid passageway through a length of casing is measured in terms of internal diameter, such as illustrated in the World Oil Casing Reference Tables. NCS Br., Ex. L When used in such a context, the term "internal diameter" indisputably refers to the diameter of the pipe or the Diameter Definition, and not to a sidewall.

20. For the reasons discussed above, and in my First Declaration, it remains my opinion that a POSA would understand an "internal diameter" to mean "the diameter of a fluid channel measured

perpendicularly from the inner wall of the fluid channel through the center of the casing string, to the opposite inner wall."

B. "tubular member" (Claims 1, 22, 28, and 50)

Defendant Nine's Construction	Plaintiff NCS's Construction
An upper tubular member, and a lower tubular member coupled with the upper tubular member.	No construction.

21. In my First Declaration, I opined that the term "tubular member" is not frequently used in the oil and gas industry. Meehan Dec, at ¶ 69. I have since discovered that "tubular member" is a common phrase in a specific area of the oil and gas industry, namely, the area of offshore oil platform construction. In that context, a "tubular member" refers to a thin-walled pipe used for building an oil platform's support structure, that are generally welded together. However, because the '445 Patent does not relate to offshore oil platform construction, it is still my opinion that the term "tubular member" would not be viewed by a POSA in the field of invention of the '445 Patent as an industry-specific term. Indeed, I have no specific reason to belive that a POSA, who need not have any offshore experience, would have encountered or been aware of the term "tubular member."

22. I understand that Dr. Rodgers identified a portion of the '445 Patent, at 7:31-38 as a type of definition of the term "tubular member." I agree with this understanding. That portion of the specification recites a substantially identical definition of "tubular member" as at 2:49-56, which I referred to in my earlier declaration. Meehan Dec., at ¶ 70.

23. For the reasons discussed above, and in my First Declaration, it remains my opinion that a POSA, in light of the specification of the '445 Patent, would conclude that the "tubular member" is an assembly comprising "an upper tubular member, and a lower tubular member coupled with the upper tubular member." Nine Br., Ex. 2 at 2:49-51.

C. "sealing engagement" (Claims 1, 22, 28, 50, and 55)

Defendant Nine's Construction	Plaintiff NCS's Construction
attached or secured to create a fluid-tight seal	a substantially fluid-tight seal

24. I understand that NCS has proposed that the word "substantially" qualify "a fluid-tight seal," because a POSA would allegedly understand that some seals leak. I disagree with this qualification. A seal that leaks is not "fluid-tight," as demonstrated by the leak. I have further reviewed the specification and claims, and have found no support therein for qualifying the term "fluid tight-seal." Accordingly, I disagree that the term "sealing engagement" should be construed to merely require a "fluid-tight seal."

25. For the reasons discussed above, and in my First Declaration, it remains my opinion that a POSA would understand "sealing engagement" to mean "attached or secured to create a fluid-tight seal."

D. "rupturing force" (Claims 1, 22, 27, 29, 56, and 57)

Defendant Nine's Construction	Plaintiff NCS's Construction
Term is indefinite under 35 U.S.C. § 112 Proposed Alternative – rupturing pressure	a hydraulic pressure or impact force sufficient to rupture the rupture disc

26. It is my opinion that an "impact force," is never described as a "rupturing force" in the specification of the '445 Patent. The most relevant section of the specification states that a rupture disc "can be ruptured by engagement with an impact surface of a tubular once a rupturing force is applied to the disc, such as by hydraulic fluid under pressure." In this example of a "rupturing force" in the specification, the "rupturing force" is identified as hydraulic pressure, which causes an impact on a surface which causes the rupture disc to fail. Put another way, hydraulic pressure and impact forces are not alternatives, but describe a cause and effect. The term "rupturing force" thus identifies the cause, the only example of which is "hydraulic pressure."

27. In my opinion, Nine's proposed construction *does not* exclude any of the embodiments of the '445 Patent, but merely identifies that the "rupturing force" is a rupturing pressure. This is present in all embodiments of the '445 Patent, all of which initiate the failure process through the application of a rupturing pressure – including embodiments where the rupture disc ultimately fails as a result impact on a surface.

28. In my opinion, NCS's proposed construction *does* exclude embodiments of the '445 Patent, including those that use a two-step process that involves the rupture disc impacting a surface. That is, a POSA reading the claims will not presume from the term "rupturing force" that what is intended is a two-step process that involves first a rupturing force, and then an impact on a surface, but merely that a force is initially applied that will result in a failure of the rupture disc – no matter the mechanism of such failure.

29. Nonetheless, this term is indefinite, because it carries the same meaning as when used in the term described below, where it is compared to a "rupture burst pressure." For this reason, Nine proposes as an alternative "rupturing pressure," which corresponds to Nine's alternative in the term discussed below.

30. For the reasons discussed above, and in my First Declaration, it remains my opinion that the claim term "rupturing force," when read in light of the intrinsic evidence, fails to inform with reasonable certainty, those skilled in the art about the scope of the invention.

E. “the rupture disc is . . . configured to rupture when exposed to a rupturing force greater than the rupture burst pressure” (Claims 1, 22, 29, and 56)

Defendant Nine’s Construction	Plaintiff NCS’s Construction
Term is indefinite under 35 U.S.C. § 112 Proposed Alternative – the rupture disc will rupture when exposed to a rupturing pressure greater than the rupture burst pressure	the rupture disc can rupture if exposed to hydraulic pressure that is higher than its rupture burst pressure

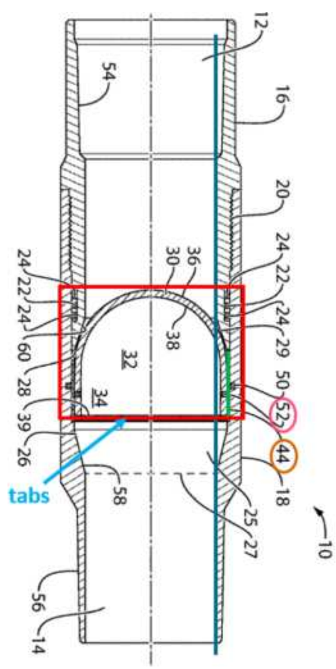
31. It is my opinion that, to the extent that “rupturing force” is construed to include impact forces, an impact force cannot be compared to a rupture burst pressure. The “rupture burst pressure” is a rating of a rupture disc and is a fixed value referring to a constant gauge pressure across the entire rupture disc. A POSA would not know how to convert an “impact force” into a figure that can be compared to the rupture burst pressure, because such an “impact force” may be distributed over a smaller part of the rupture disc, or combined with a gauge pressure across the rupture disc. Even though a pressure may be convertible to a force, converting the rupture burst pressure of a rupture disc to a rupture force would provide a POSA no meaningful information about when the rupture disc would fail relative to an impact force.

32. For the reasons discussed above, and in my First Declaration, it remains my opinion that the claim term “the rupture disc is . . . configured to rupture when exposed to a rupturing force greater than the rupture burst pressure,” when read in light of the intrinsic evidence, fails to inform with reasonable certainty, those skilled in the art about the scope of the invention a POSA, in light of the specification, would not cannot be resolved by any reasonable construction.

F. "the region of the tubular member where the rupture disc is attached has a larger internal diameter than the internal diameter of the casing string and is parallel to the internal diameter of the casing string" (Claims 1, 22, 28, and 50)

Defendant Nine's Construction	Plaintiff NCS's Construction
Term is indefinite under 35 U.S.C. § 112 Proposed Alternative – a flat surface of the tubular member where the rupture disc is fastened, affixed, joined, or connected to the tubular member is circular and has a diameter larger than the internal diameter of the casing string, and defines a plane that is parallel to a plane defined by the set of internal diameters at a location in the casing string	In the first portion of the tubular member, the rupture disc is directly secured to and in sealing engagement with a cylindrical surface that is wider than and parallel to the inner surface of the casing string

33. NCS claims that "the region of the tubular member where the rupture disc is attached . . . is parallel to the internal diameter of the casing string" means "in the first portion of the tubular member, the rupture disc is directly secured to and in sealing engagement with a cylindrical surface that is . . . parallel to the inner surface of the casing string." NCS Br., at 10. In support of this proposed construction, NCS presents an annotated version of Figure 2 from the '445 Patent:



NCS Br., at 11. NCS claims that "the surface where the disc presses against the side wall (**green** line) is parallel to the casing string wall (**blue** line)." NCS Br., at 13.

34. NCS claims that "'the region of the tubular member where the rupture disc is attached' is a surface located in the region (**red box**) that is 'directly secured to and in sealing engagement with the rupture disc.'" However, this region is not entirely parallel to NCS's casing string wall (**blue** line) because the convex portion of the disc that is attached to the tubular member is not parallel to the casing string wall.

35. NCS claims that "parallel, cylindrical surfaces are described in the patent extensively," but the word "parallel" is only used in the independent claims and does not appear in the disclosure of the '445 Patent. Figures 2 and 3 also do not support NCS's position that two cylindrical surfaces are parallel.

36. A POSA would not ordinarily describe two cylinders sharing the same axis as being parallel. Simply identifying two parallel lines depicting sidewalls in a cross-section, as NCS did in Figure 2 of the '445 Patent, is not enough because those lines depict three-dimensional objects in any real-world embodiment. Instead, a POSA would describe cylinders with common axes as coaxial or concentric. Such phrasing does indicate that the axes of the cylinders are parallel simply because a line, such as the common axis of the cylinders, is definitionally parallel with itself. Accordingly, a POSA would not generally describe two cylinders having a common axis as "parallel," although a POSA may understand some logic by comparison of the axes of the cylinders. Further, by the same logic, two cylinders could be "parallel" even though they are not coaxial. But there is no suggestion in the '445 Patent that there are any cylindrical features with offset – yet parallel – axes.

37. For this same reason, NCS's construction does not flow naturally or clearly from the claim language, and even if it did, would require a POSA to make two inferential steps to determine whether two cylinders are coaxial: (1) a POSA would have to translate the features claims into geometric terms - cylinders; and (2) a POSA would have to identify that a component of those geometric shapes – their axes – are parallel.

38. For the reasons discussed above, and in my First Declaration, it remains my opinion that the claim term "the region of the tubular member where the rupture disc is attached has a larger internal diameter than the internal diameter of the casing string and is parallel to the internal diameter of the casing string," when read in light of the specification, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

G. "specific gravity . . . of the well fluid" (Claims 24 and 52)

Defendant Nine's Construction	Plaintiff NCS's Construction
Term is indefinite under 35 U.S.C. § 112	No Construction

39. This term is indefinite because it presupposes a false concept—that well fluid has a constant specific gravity through the depth of the well. But it is well understood by POSA's that the density, and thus the specific gravity, of well fluid changes with depth due to changes in pressure and temperature, as confirmed by extrinsic evidence in the field. Nine Br., Ex. 13. Accordingly, the term is indefinite, because it describes a feature that cannot exist.

40. For the reasons discussed above, and in my First Declaration, it remains my opinion that the claim term "specific gravity . . . of the well fluid," when read in light of the specification, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

H. "disengage the rupture disc from sealing engagement" (Claim 55)

Defendant Nine's Construction	Plaintiff NCS's Construction
disengage the rupture disc from being attached or secured to create a fluid-tight seal	Before rupturing, move the rupture disc relative to the region

41. NCS proposes construing "disengage the rupture disc from sealing engagement" as "before rupturing, move the rupture disc relative to the region." However, NCS's construction eradicates "disengage" from the claim term. Merely moving the rupture disc before it ruptures is insufficient to "disengage the rupture disc from sealing engagement." The claim is clear that the disc must ***disengage*** ("to release from attachment or connection," *see* Ex. 5, at 353)[1] from sealing engagement. The seal can be maintained even when the rupture disc moves. NCS even admits that "the seal between the rupture disc and the tubular member . . . is lost when the disc ruptures." Thus, merely moving the rupture disc is insufficient to disengage the rupture disc from sealing engagement. According to NCS, rupturing the disc is what causes the disengaging of the rupture disc from sealing engagement.

42. Similarly, nothing in the claims requires the rupture disc to move relative to the region before the rupture disc disengages from sealing engagement or is ruptured. In fact, the specification never discloses a rupture disc that moves and maintains sealing engagement.

43. For the reasons discussed above, and in my First Declaration, and a POSA's understanding of the term "sealing engagement," it remains my opinion that a POSA would have understood this

[1] I previously cited this reference in my First Declaration. *See* Nine. Br., Ex. 1, at ¶110. However, the page from Exhibit 6 that included the definition of "disengage" was unintentionally omitted. *See* Nine Br., Ex. 6. Opposing counsel received this reference during my deposition and deposed me regarding the term "disengage" as defined in this reference. This reference is presented as Exhibit 5 to Nine Energy Service, Inc.'s Responsive Claim Construction Brief and is intented to support my First Declaration at paragraph 110 and this Supplemental Declaration.

term to mean the release of the rupture disc from being attached or connected to create a fluid-tight seal.

I. "rupture disc is configured to disengage from sealing engagement when exposed to a pressure greater than a hydraulic pressure in the casing string" (Claims 28 and 50)

Defendant Nine's Construction	Plaintiff NCS's Construction
Term is indefinite under 35 U.S.C. § 112	the rupture disc, before rupturing, can move relative to the first portion when exposed to a pressure that is greater than a hydrostatic pressure in the casing string (i.e. a disengaging pressure)

44. NCS's proposed construction requires movement following exposure to a certain pressure, but a POSA, in light of the specification, would understand that this feature is provided by the shear ring, not the rupture disc. *See* Nine Br., Ex. 2, at 8:48-50, 8:67-9:4. Further, as previously stated in my First Declaration, the specification fails to disclose any features of the rupture disc that would satisfy this limitation. *See* Nine Br., Ex. 1, ¶115.

45. For the reasons discussed above, and in my First Declaration, it remains my opinion that the claim term "rupture disc is configured to disengage from sealing engagement when exposed to a pressure greater than a hydraulic pressure in the casing string," when read in light of the intrinsic evidence, is indefinite because it fails to inform with reasonable certainty, those skilled in the art about the scope of the invention.

I declare under penalty of perjuryunder the laws of the United States of America that the foregoing is true and correct.

Executed in Houston, TX, USA

By: Ph.D., P.E.

Date: Nov. 20, 2020

STATE OF TEXAS
DONALD NATHAN MEEHAN
92247
LICENSED
PROFESSIONAL ENGINEER

EXHIBIT A
List of Documents Available Through OnePetro.org

Journals

Journal	Years Available
Corrosion	1992 - 2006
International Journal of Offshore and Polar Engineering	1991 - present
Journal of Canadian Petroleum Technology	1962 - 2015
Journal of Petroleum Technology	1949 - present
Journal of Sailboat Technology	2010 - 2014
Journal of Sailing Technology	2016 - present
Journal of Ship Production	1985 - 2009
Journal of Ship Production and Design	2010 - present
Journal of Ship Research	1957 - present
Journal of the Society of Petroleum Evaluation Engineers	1968 - 1970
The Log Analyst	1960 - 1999
Marine Technology and SNAME News	1964 - 2010
Oil & Gas Executive Report	1998 - 1999
Oil and Gas Facilities	2012 - 2016
Oil Industry Journal	2016 - present
Petroleum Technology	1938 - 1946
Petrophysics	2000 - present
Professional Safety	2007 - present
PROneft Journal	2019 - present
Society of Petroleum Engineers Journal	1961 - 1985
SPE Advanced Technology Series	1993 - 1997
SPE Computer Applications	1989 - 1997
SPE Drilling & Completion	1993 - present
SPE Drilling Engineering	1986 - 1992
SPE Economics & Management	2009 - 2017
SPE Formation Evaluation	1986 - 1997
SPE Journal	1996 - present
SPE Production & Facilities	1993 - 2005
SPE Production & Operations	2006 - present
SPE Production Engineering	1986 - 1992
SPE Projects, Facilities & Construction	2006 - 2011
SPE Reservoir Engineering	1986 - 1997
SPE Reservoir Evaluation & Engineering	1998 - present
Talent & Technology	2007 - 2008
Transactions of the AIME	1885 - 1960
The Way Ahead	2005 - 2016

Conference Proceedings

Organizations
American Petroleum Institute
American Rock Mechanics Association
American Society of Safety Engineers
BHR Group
Carbon Management Technology Conference
International Petroleum Technology Conference
International Society of Offshore and Polar Engineers
International Society for Rock Mechanics and Rock Engineering
NACE International
Offshore Mediterranean Conference
Offshore Technology Conference
Petroleum Society of Canada
Pipeline Simulation Interest Group
Society of Exploration Geophysicists
The Society of Naval Architects and Marine Engineers
Society of Petroleum Engineers
Society of Petrophysicists and Well-Log Analysts
Society of Underwater Technology
Unconventional Resources Technology Conference
World Petroleum Congress

EXHIBIT B
Documents Reviewed

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